



Electric Vehicles: The Utility Connection

Webinar Questions and Answers

December 11, 2019

Question and Answer Session

How can electric vehicles (EVs) can be used within the grid as an energy storage resource and are there any examples that you can recommend people check out?

Erika Myers: I would suggest taking a look at some resources that are available online from folks like the Electric Power Research Institute has done quite a bit on vehicle-to-grid. But there's also quite a bit of activity going on in Europe and in Asia, particularly Japan. There's quite a bit of work that's been done especially in the United Kingdom (U.K.) on looking at early deployments of vehicle-to-grid opportunities. We are starting to see some utilities here in the United States (U.S.) that have made announcements about vehicle-to-grid. I know that Ikehu in Hawaii had a vehicle to grid (V2G) program for specifically as backup for a home application that was more like vehicle to home (V2H). But we're still pretty much in the early stages of leveraging the on-vehicle battery for grid purposes. We see a lot of interest in using the batteries on school buses for V2G just because of their flexibility, especially in the summertime, to be connected using the batteries for the storage purposes. It'll be a little bit more difficult, I think, for high volume using vehicles like within certain fleets, especially delivery vehicles or residential I think just the size and the complexity of leveraging residential applications could be more nuanced. But certainly that's something that we see as an opportunity set in the future. And there will be a lot of steps to get to that stage. So that's why a lot of our research around load management up to this point has been focused largely on managed charging, which is a little bit more a way of traditional demand-response types of benefits for energy storage but less on pushing out into the grid like you could with stationary storage.

Hanna Terwilliger: I mentioned that our largest utility, Xcel Energy, they're starting to look at school buses. That's where they've indicated interest. And then I there's the vehicle-to-grid. You can also look at electric vehicles as a grid resource aside from the ability to provide electricity back to the grid, for demand flexibility, to shift around when the electricity is being used, especially in a place like Minnesota where we have a large amount of wind, it can be used to prevent wind curtailments. Then you soak up that extra energy overnight while it's less expensive. And then even doing other types of grid support are, of course, possibilities, even if it's not selling that electricity back to the grid. So I think thinking about EVs as a grid resource goes beyond just the vehicle-to-grid capabilities and looking at kind of holistically the other types of grid support that EVs can provide.

Emeka Anyanwu: To echo what all of my colleagues have said, just the one thing I would layer on is that one of the considerations we have in Seattle, given our vantage point, is the ability to leverage those resources such as school buses or even transit buses as community resources in the event

of an emergency, some kind of a natural event or disaster or something that leads to widespread infrastructure damage and/or outages. And schools or even transit or fleet depots can be gathering spots for communities. And so, the ability to utilize those as community resources is something that we also have factored into the way we're thinking about this.

Are there any very localized transmission impacts that you're seeing from unmanaged charging?

Erika Myers: Yeah, absolutely, our utility members are looking into this issue. We actually highlighted in a report that we did a few years ago that based on some analysis done by the Sacramento Municipal Utility District that they experience a high penetration scenario of a quarter million EVs and their service territory they anticipated they would need to replace approximately 17 percent of their pole mounted transformers at a pretty high expense and many millions of dollars to replace. So, they saw as more and more EVs came into their service territory that in combination with rates, they could use managed charging as a way to minimize those pocket costs for system upgrades. And we have had anecdotal conversations here and there with utilities that are seeing impacts from clustering in certain parts of their service territories.

Hanna Terwilliger: We haven't heard anything specific. There was an anecdotal evidence not of a distribution upgrade, but we did have one municipal utility that spoke at one of our presentations that said, "We knew when this one household bought two Teslas because suddenly their monthly consumption doubled." So, especially in small utilities where they have a lot more awareness, they could tell, but it didn't cause a problem for them. So we haven't heard of any issues. We are tracking that through our Transportation Electrification Plan. And then of course, we're working to make sure that we don't ever have to – get to that point by encouraging the smart rate design and then looking into managed charging as well.

Emeka Anyanwu: Once again I'll echo what has been said. We are not tracking any specific system impacts from the adoption of electric transportation. I think we generally feel like we are in a position to be able to respond to those favorably. One other thing I will say - that this is part of a picture for us. One of the things that we are contemplating here in Seattle is really the architecture of the system of the future. And so, we are thinking about and looking at how we scope what that might look like and how do – how we plan a transition to what will be probably a new transmission and distribution (T&D) system architecture that looks pretty different from what we have today. And that includes not just, obviously, electric transportation, but also all other kinds of technologies and resources. One other thing that I will say, which speaks to our value of equity that I talked about in my presentation, is that as we think about the way utility infrastructure costs are spread out and paid for, we are very conscious of the fact that the early adoption of electric vehicles specifically is very concentrated in populations that are very wealthy and very white. And so, that is just a fact of social reality. And so, what we try to do is think about how – as we react to those infrastructure costs, we are being conscientious about making sure that we are managing that cost causation and being equitable about how the utility invests to prepare for those transitions.

What has been your experience or what research have you seen about consumer acceptance of the utility having control of how their car is charged? Are there financial incentives that are needed for EV specific rates to kind of encourage participation in those managed charging programs in order to give up that control?

Erika Myers: Yeah. That's great question. I'd encourage everyone to take a look at the Electric Nation report that was just published in the U.K. That was probably one of the largest managed charging

studies that has been done to date and essentially is roughly about 600 or 700 residential households that were participants in this managed charging pilot program. They did a whole host of customer satisfaction and surveys. What they found was that, generally speaking, the majority of their customers didn't care if their charge was moved as long as they had what the charge that they needed when they used the car the next day. So, they were less concerned with when it was being charged and who was controlling it than it – than they were about having the access. This is not just limited to the study. I've heard similar types of findings from many other managed charging programs that have published results. I encourage you to also take a look at Avista Utilities' Managed Charging Report that they just published a couple months ago. It does detail that as well as the BMW i3 charging pilot that was done with Pacific Gas and Electric Company (PG&E). So all three had the same general conclusions that customers were fine as long as they had an ability to opt out of a charging event, as well as – so having some control over that in the event that they did have something that they needed to, drive to out of their traditional charging hours and things like that. But otherwise, generally speaking, people are fine with it.

What is the standard of review that the Public Utilities Commission (PUC) uses to evaluate the utility EV pilots and other utility EV programs?

Hanna Terwilliger: So it depends a little bit on the type of pilot or projects that we're seeing. If there's not ratepayer funds being spent, especially in our residential charging pilots, the costs are completely borne by the participant in the pilot, so they're paying for their own charger. They're paying for their own sub-meter. In that case, it's just asking, if the customer is going to save money? Is it widely supported by our stakeholders? And then in instances where there are ratepayer expenditures, the Commission and its order, looking for our generic docket talks about using cost benefit methodologies, if there is a large expenditure of ratepayer funds. Thus far, we've had a lot pilot projects and so the Commission has looked at those to see if what's needed to be studied, how that's going to impact future rollouts and looking at it from a data collection point as well. The majority of what we've had come through so far have been revenue neutral proposals, and so we haven't had to worry about the expenditure of ratepayer funds.

Could provide a few additional examples on how you're working to expand extend benefits to underserved communities?

Emeka Anyanwu: I think that is still evolving. We're in the middle of having those conversations, but in a manner of speaking what we are looking at a couple different things. We're looking at pilots that focus on access to- and availability of- charging infrastructure in underserved communities. We are running an EV charging pilot at just over 20, about 22 electric vehicle charging stations installed throughout our service territory. We focused many of those in what we would consider underserved or historically underrepresented communities. We are also looking at some pilot work around residential charging, both for our low income customers, but also even for access to charging for folks who are not homeowners. So those are a couple of different things in a couple of different ways where we are trying to create opportunity, trying to expand opportunity for some communities that might otherwise get left out of the transition.

Today we've been talking about transportation electrification, but you could touch briefly on how this fits into and whether you have the transmission capacity to address a broader electrify everything strategy?

Emeka Anyanwu: I think the answer to that is to be determined (TBD), right? Specific to Seattle we don't have any sort of foreseeable concern, but they're regionally both in the Pacific Northwest and the Western United States on a larger scale there is very much a conversation going on about the abilities of our existing interstate transmission system to accommodate the kinds of energy transfer impacts that might happen in a fully electrified future. So, I think that's a "to be continued" situation.

There's not always very broad participation in some of these PUC proceedings and working groups. Do you have any thoughts or suggestions or recommendations of how to better involve municipal municipalities across the state or across other states in those PUC proceedings?

Hanna Terwilliger: In Minnesota, we are fortunate to have a very engaged stakeholder community. I will say a lot of our cities outside of our large metro areas are in cooperative or municipal utility service territories. Our utilities see it is important for them to be reaching out to their local governments. We also have, at least in the metro area for Minneapolis, St. Paul, our Metropolitan Council will track some of these efforts. We have a number of stakeholder groups and nonprofits that routinely engage with stakeholders on behalf of our utilities. So while we're not necessarily running our own stakeholder outreach process, that's not historically been something that the Commission has done, we do direct our utilities to do that outreach. They oftentimes partner with local nonprofits. We also have started venture into the 21st century to use more social media to try and alert groups to when we have new filings that might be of interest to them and then just doing outreach through other partners as well. A lot of times it does take extra resources and so as staff here, not just on electric vehicle issues, but we do try and meet with any stakeholders, local governments to give them an overview of the PUC, how to get involved, and what types of issues that might be worthwhile for them to weigh in on.

Erika, your presentation showed that sometimes commissions or legislators or other governing bodies spur rules and recommendations on electric vehicle rates, how do those entities typically work with utilities to then create and enact those rules and recommendations?

Erika Myers: Yes, I think that the question was referring to the slide that showed the utility survey of the different reasons why utilities did electric vehicle rates, and certainly having legislators or public utility commissions direct the utilities to do EV rate programs is a potential mechanism by which a rate comes about. But what we actually found was that utility-driven EV rates were more likely to be successful in terms of enrollment. We didn't get into the – we didn't flesh out the reasons for that. We have a suspicion that it is related to the utility investments in that load management strategy and therefore, putting into play the resources, including things like staffing and marketing to make that a success. Again, we didn't get into trying to find the reasons for that correlation.

What do you see as the most critical challenge or roadblock for utilities interested in pursuing vehicle electrification policies and programs?

Emeka Anyanwu: I would say the most critical challenges is one of perception, which is how folks really think of the transition to electric transportation and how folks think it will be – how it will come about, right? The conversation seems to lend itself oftentimes to what can we incentivize? What can we pay for? What charges can we cover? As opposed to really thinking about the systemic issue and trying to figure out how do we enable access to the benefits of electric transportation to the largest group of people. Really beginning to have that conversation in a way that highlights and leans into that discussion, I think is a challenge for us, but it's an important thing to an important thing to elevate.

Hanna Terwilliger: From the Commission standpoint, we have two goals with transportation electrification. One, we want to make sure that transportation electrification is done in a way that does

not cause any adverse impacts. Two, we also want to make sure that we're encouraging transportation electrification because it can bring further benefits to all ratepayers and to Minnesota and society as a whole. As we look at that, one of the most important things is getting participants on either time of use or managed charging rates for our residential and fleet charging, because that's what's going to help bring those widespread benefits, both by encouraging higher renewable penetration and encouraging demand flexibility, getting participants lower system costs. Thinking about the challenges, as Erika mentioned around metering, around getting customers to sign up, that's what we're really going to have to focus on in the coming couple of years as we moved from our pilot phase of a lot of programs into permit program implementation.

Erika Myers: Hanna, already did a great job of echoing the need for load management and the importance of that as we think about rolling out these programs. In a more detailed and nuanced level, I think we need to also be thoughtful about how utilities might go about justifying the cost of investment for rates, EV specific rates, as well as managed charging programs. As an industry, we all can support the development of standards and unification around standards for EV charging infrastructure, making sure that we're encouraging Electric Vehicle Supply Equipment (EVSE) equipment manufacturers to use open protocols versus proprietary that will help reduce costs for implementing these programs. We also need to make sure that we are thinking about program design. There's hundreds of use cases, when we think about the whole spectrum of different types of EV deployments and who are the users and how can we integrate them and enroll them into programs and what are the value stacks that we can use to justify the cost? There's hundreds of these. We only have identified about 40 programs to date. So we don't have enough program examples to really come up with best practices at this point and how to even go about designing a program. So we're all responsible here for making sure that we test lots of different hypotheses and test out different strategies so that we can find the ones that work before we see this massive uptick of EV adoption. We have a couple years to figure all this stuff out. It's very time sensitive. So yeah, timing is crucial.

Questions Not Answered during the Webinar

What is the typical one-time and monthly incremental cost for providing the telematics, metering, and other devices needed for managed residential charging vs. simple "dumb" charging equipment?

Erika Myers: The program expenses largely depend on the method of communication (e.g., Wi-Fi, cellular).

Hanna Terwilliger: As one example, Xcel's Home EV Service that uses Wi-Fi to pass along submetered charging data; operations and maintenance, accounting, and network services are \$5.60-\$7.77 per month depending on who the charging provider is ([PUC Docket No. 19-559](#)). Program expenses will also depend on the incremental cost of a networked charger versus a non-networked. I have not seen any published data that provides a thorough review of the incremental cost to date, but recommend that utilities publish a request for information to obtain that information directly from EVSE vendors.

Are utilities interested in buying electricity back from the cars to smooth out an increase in demand?

Erika Myers: Utilities are considering opportunities for V2G as a potential alternative to stationary storage or building new generation capacity (especially peaking plants). At this stage however, some utilities are developing pilot projects to test out this use case.

Are the special rates being discussed specifically about EV? Or are they general time-of-use rates?

Hanna Terwilliger: All the rates discussed and outlined in the slides are EV-specific, and use either a second metered service or embedded submeter in a Level 2 charger. Some Minnesota utilities also offer whole-house time of use (TOU) rates, but those are not included in the chart. For example, Xcel Energy is starting a whole-house residential TOU pilot and plans to gather data on participants that also own EVs ([PUC Docket No. 17-775](#)).

What was the nature of the appeal for Minnesota PUC Docket No. 18-643?

Hanna Terwilliger: You can find more information from the [Minnesota Court of Appeals](#), case number A19-1785.

Are Minnesota utilities using rate payer funds to fund consumer education and outreach aimed at supporting EV adoption, and if so can you provide some examples of what they are doing?

Hanna Terwilliger: Minnesota utilities are allowed to use ratepayer dollars for promotional EV activities under [Minnesota Statute 216B.1614](#). This is an exception to other portions of Minnesota law that do not allow ratepayer dollars to be spent on encouraging increased electric sales. Details of utilities promotional activities can be found in their annual reports in the following dockets:

- Minnesota Power: Docket No. 15-120
- Otter Tail Power: Docket No. 15-112
- Xcel Energy: Docket No. 15-111
- Transportation electrification plans: Docket No. 17-879

To search Minnesota's [eDockets website](#), enter the docket year (ex. 17) and number (ex. 879) and hit "search." Registration is not required.

What's phase 2 and its timeline?

Emeka Anyanwu: Phase 2 of Seattle City Light's Transportation Electrification Action Plan activities will start immediately following a vote of approval of the Plan by the Seattle City Council. We are planning to deliver the Plan to City Council in early quarter two of 2020. City Light's Phase 2 strategy and timeline is still being developed but will include activities such as further engagement with communities and stakeholders and a process to scope, design and implement customer-facing transportation electrification programs, as well as supportive utility- and community-based projects and process improvements.

What are the difference between V2H and V2G in terms of both implementation costs and revenue generation opportunities, from both a utility and customer perspective?

Emeka Anyanwu: The primary difference between V2H and V2G has to do with where communications and power from the electric vehicle's battery is being directed. With V2H, the EV battery is linked to smart energy controls in the owner's home and can be used as a power source during a power outage for example. With V2G, the EV battery can communicate with the grid and either adjust the vehicle's charging rate or the amount of power returned back to the grid. V2G offers a benefit to utilities in being able to provide demand response services. Costs and revenue opportunities will vary widely for both the utility and the customer depending on a number of variables specific to the use cases applicable to V2H and V2G. Seattle City Light is currently researching and reviewing the applicability and value of V2G technology for our distribution grid.

Is there any consideration of setting a national ESVE standard that would ensure that all vehicles sold in the U.S. will be able to charge at all Level 3 charging stations?

Jessica Daniels: Unlike for Level 1 and Level 2 charging, there is not a standard connector and charge port for direct current (DC) fast charging that all vehicles can use. The three DC Fast charging systems in use in the United States are the Society of Automatic Engineers (SAE) Combined Charging System (CCS), CHAdeMO, and Tesla. Drivers can find stations that will work for their vehicle using the [Electric Vehicle Charging Station Locator](#). Although there is not a universally adopted standard, many DC fast charging stations provide both CCS and CHAdeMO connectors—effectively allowing all vehicles to charge at these stations (though Tesla vehicles would need to use an adapter.)